

U.S. Patent Application Serial No. **10/583,000**  
Response filed January 21, 2010  
Reply to OA dated August 27, 2009

**REMARKS**

Claims 1-12, 15-19, 23, 25 and 27-40 are pending in this application. Claim 36 is canceled without prejudice or disclaimer, claims 27, 28, 31-33, 37 and 38 are amended herein. Upon entry of this amendment, claims 1-12, 15-19, 23, 25, 27-35, and 37-40 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment.

Support for the weight ratio range of "95:5 to 30:70" in claims 27, 28 and 33 may be found in the disclosure at page 29, lines 16-20.

Support for the weight ratio of "90:10 to 60:40" in claim 32 may be found in the disclosure at page 29, lines 16-20.

**Regarding the finality of the Office action.**

In the Office action of August 27, 2009, the Examiner introduced a new rejection of claim 31 under 35 U.S.C. 112, second paragraph. However, claim 31 was not amended in the last amendment, and the rejection is directed at wording that was present in the original claim. Therefore, the Examiner has introduced **a new ground of rejection that was not necessitated by amendment**, and the finality of the Office action is improper (see MPEP 706.07(a)). Applicant respectfully requests that the finality of the present Office action be withdrawn.

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**Claims 31 and 32 are rejected under 35 under U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office paragraph no. 1)**

1) The Examiner states that the term “obtainable” in claim 31 renders the claim indefinite. The rejection is overcome by the amendment to claim 31, in which “obtainable” is amended to –obtained–.

2) The Examiner states that the limitations of claim 32 appear redundant. The rejection is overcome by the amendment to claim 32 in which the weight ratio range is narrowed to – 90:10 to 60:40 –. Support for this amendment may be found at page 29, lines 16-20, of the specification.

**Claims 1-12, 15-21, 23, 25 and 27-40 are rejected under U.S.C. §103(a) as being unpatentable over JP 07-278374 in view of Sadamitsu et al. 2006/0091581. (Office action paragraph no. 5)**

Reconsideration of the rejection is respectfully requested. Applicant here responds to the arguments made by the Examiner in paragraphs no. 8-11 of the Office action.

Regarding Paragraph No. 8

(1) In paragraph no. 8 of the Office action, the Examiner does not accept Applicant’s argument that JP-07-278374 uses nucleating agents to improve the transparency of resin, and that it merely discloses fatty acid metal salt as one of many optional ingredients.

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The Examiner asserts that there is no patentable distinction between controlling the crystallization rate of a resin composition, as claimed, and the transparency of a resin composition as discussed in the art. The Examiner states that **crystallinity and transparency are closely related**. The Examiner also states that **the more the crystalline the polymer structure, the more transparent the resultant molding**.

The Examiner further asserts that the applicant's attempts to distinguish the claims from the art by arguing the **distinctions between the crvstallinity and transparency are not persuasive, since these are simply different terms to describe the same property**.

(2) However, Applicant submits that the Office Action lacks technical support for the Examiner's above-described assertions, and that these assertions are incorrect.

First of all, the Examiner's assertion that **the more the crystalline the polymer structure, the more transparent the resultant molding** is contrary to the common technical knowledge in the art. Generally, when crystallization progresses in a crystalline resin composition, the transparency **decreases** due to the occurrence of dispersion, reflection and the like of visible light on the crystal surface. This is also clear from the disclosure in JP'374 that polypropylene resins have low transparency because they are crystalline (paragraph [0003] of JP'374).

The transparency of a crystalline resin composition is greatly affected by the **crystal size**. Given the same crystallinity (amount of crystallized portion), the smaller the crystal size, the greater the transparency would become.

(3) The Examiner asserts that **crystallinity and transparency are closely related**. However, Applicant submits that in the common technical knowledge in the art, there is **no correlation** between these two properties. This is the case for the present invention, as demonstrated by the measurement results of the Examples in the present specification.

For example, Examples 1-8 in Table 1 of the present specification indicate the following. In Examples 1-8, polyolefin-based resin molded products were prepared using the same type and amount of amide-based compound (A), and a different type or amount of fatty acid metal salt (B). The resulting polyolefin-based resin molded products had almost the same haze values of 13-14%. However, a large difference ranging from 105 to 117°C was observed in the crystallization temperatures ( $T_c$ ) of Examples 1-8. In other words, the polyolefin-based resin molded products produced in Examples 1-8 are greatly different in terms of their crystallinity, but similar in transparency. As described above, the measurement results clearly indicate that the transparency (haze value) is not related to the crystallinity (crystallization temperature).

Again, Applicant submits that the Examiner's assertion is contrary to the common technical knowledge in the art, and certainly is not the case for the present invention.

(4) The Examiner seems to incorrectly believe that "crystallinity" is synonymous with "controlling the crystallization rate" in the present invention. However, crystallization rate and crystallinity are completely different properties, and have no correlation to each other. Therefore, even if the crystallization rate is increased, the crystallinity would not always be increased.

Generally, crystallinity is evaluated by crystallization temperature ( $T_c$ ). There is a tendency for the crystallinity to increase along with the increase in the crystallization temperature ( $T_c$ ). JP'374 discloses that the **crystallization temperature ( $T_c$ )** of the propylene resin is affected by selecting specific nucleating agents, and the amounts thereof added.

In contrast, as Applicant explained in the response to the previous Office Action, the present invention achieves control of the crystallization rate (that is reflected by the end time of crystallization, " $T_e$ ," as disclosed on pages 91-92 of the specification) of the polyolefin-based resin by incorporating amide-based compound (A) and fatty acid metal salt (B) at a specific weight ratio into a polyolefin-based resin. This effect is disclosed on page 115, lines 3-11 of the specification. Controlling the crystallization rate of polyolefin-based resin by adjusting the amounts of component (A) and component (B) is greatly advantageous to its production process.

(5) JP'374 merely lists lubricants (aliphatic hydrocarbons, such as paraffin and wax,  $C_{8-22}$  higher fatty acids, and metal salts of  $C_{8-22}$  higher fatty acids) as various other components optionally added (paragraph [0033] of JP'374). Sadamitsu et al. (hereunder referred to as Sadamitsu) also merely lists lubricants (aliphatic hydrocarbons, such as paraffin and wax,  $C_{8-22}$  higher fatty acids, and metal salts of  $C_{8-22}$  higher fatty acids) as various other components optionally added (paragraph [0039] of Sadamitsu).

Examples 24-26 (Table 2 on page 114 of the Specification) clearly indicate that even when polyethylene wax, stearyl alcohol, or glycerol monostearate, which are disclosed in Sadamitsu as optional components, are used in combination with component (A), the significant effect of the

present invention could not be achieved (see page 115, line 22 to page 116, line 3 of the specification).

The cited documents are silent about using component (A) and component (B) as essential components at a specific weight ratio, as well as silent about the distinguishing effect of the present invention, i.e., the crystallization rate of polyolefin-based resin becomes controllable by such a use of component (A) and component (B).

Therefore, Applicant argues that there is no clear suggestion for the use of component (A) and component (B) in the cited references. Moreover, the excellent effect of the present invention that the crystallization rate of polyolefin-based resin becomes controllable by using component (A) and component (B) as essential components at a specific weight ratio is completely unexpected from the disclosures of JP'374 and Sadamitsu. On this basis alone, the present claims, which recite component (A) and component (B) as essential components, are clearly not obvious over JP'374 and Sadamitsu.

Regarding Paragraph No. 9

(1) The Examiner does not accept Applicant's argument that Sadamitsu does not teach the **tri-amide** of the present invention, but rather teaches **di-amide compounds**. The Examiner states that JP'374 discloses the claimed tri-amide compounds, and Sadamitsu discloses di-amides and fatty acid metal salts, and that it is therefore obvious for a skilled artisan to combine the teachings of JP'374 with those of Sadamitsu to apply a fatty acid metal salt in the technique of JP '374.

(2) However, as described above, neither JP'374 nor Sadamitsu teaches the distinguishing effects of the invention, i.e., that the crystallization rate of polyolefin-based resin is controllable by combining component (A) and component (B) as essential components at a specific weight ratio. This argument is applicable to claims 1-8 (compositions for controlling the crystallization rate), claims 9-12 (methods for controlling the crystallization rate), claims 15-19, 23, 25, and 33-39 (processes for producing molded products using the composition for controlling the crystallization rate), and claims 29-32 (resin compositions comprising the composition for controlling the crystallization rate), wherein component (A) and component (B) are contained as essential components at a specific weight ratio.

Regarding Paragraph No. 10

(1) The Examiner asserts that the fact JP'374 does not mention controlling the rate of crystallization is not germane to the patentability of the present invention. The Examiner is of the opinion that JP'374 shows "the same amide compounds as those claimed used in the same polymeric compositions and molded articles formed therefrom." The Examiner also asserts that it is reasonable to presume that the same compounds impart the same properties when added to the same polymers.

(2) Applicant respectfully submits that the Examiner appears to be incorrectly applying an "inherency" argument to the present issue of obviousness. It is true that JP'374 uses the same amide compounds as those of the present invention to obtain polymer compositions, and uses them to produce molded articles. However, both JP'374 and Sadamitsu merely disclose fatty acid metal salts

as an example of various optional components. Neither JP'374 nor Sadamitsu teaches or suggests the effect of controlling the crystallization rate of the polyolefin-based resin molded article that is achieved by selecting a fatty acid metal salt from a great many known compounds usable as additives for resin compositions, and using the fatty acid metal salt in combination with a specific tri-amide compound in a specific weight ratio. The fact that the prior art references, so **modified** to meet the limitations of the present claims, would have the properties of the present invention does not provide the basis for a rejection.

(3) The results of Examples of the present invention clearly indicate that the crystallization rate of polyolefin-based resin can be controlled by adjusting the amounts of (A) amide-based compound and (B) fatty acid metal salt. For example, Examples 1-3 shown in Table 1 of the present specification indicate that when the amount of (A) amide-based compound was fixed at 0.2 part by weight, and the amount of (B) fatty acid metal salt was decreased from 0.05 to 0.02, and to 0.01 part by weight, the crystallization rate (Te) decreased from 2.94 min. to 1.40 min., and to 1.00 min. However, as shown in Table 2, in Examples 21-23, when (B) fatty acid metal salt was not added, and the amount of (A) amide-based compound was decreased from 0.2 to 0.15, and to 0.1 part by weight, a significant change was not observed in the crystallization rate (Te), i.e., the crystallization rate varies from 0.96 min, to 0.97 min., and to 1.01 min, thus undergoing substantially no change.

(4) As described above, in the present invention, the crystallization rate of polyolefin-based resin can be controlled by adjusting the amounts of component (A) and component (B). This



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remarkably increases the flexibility in setting other conditions in the molding process; therefore, the present invention provides a technique that is greatly useful from a practical standpoint,

It would not have been obvious for a skilled artisan to select a fatty acid metal salt from a great many known additives, and then to use the fatty acid metal salt in combination with a specific tri-amide-based compound at a specific weight ratio to thereby control the crystallization rate of the polyolefin-based resin molded article, based on the teachings of JP'374 and Sadamitsu, both of which are totally silent about the object of controlling the crystallization rate of the polyolefin-based resin.

Regarding Paragraph No. 11

(1) The Examiner is of the opinion that the "fibrous particles" of claims 27, 28, and 33-40 are also disclosed in Sadamitsu. The Examiner states that, based on the description in [0045] of Sadamitsu, the "fibrous particles" in the amide compound of Sadamitsu seem to be "needle crystals" or "columnar crystals."

The Examiner further asserts that this disclosure of Sadamitsu seems to overlap in scope with the claimed "fibrous particles," "orientation degree," and "reflection intensity." Furthermore, the Examiner asserts that "[t]he fact that the art is silent as to the claimed property is no reason to believe that the property is not possessed by the composition and/or moldings therefrom."

(2) Reconsideration of the rejection of claims 27, 28 and 33-40 is respectfully requested in view of the amendment of Claims 27, 28 and 33 to require component (B). Specifically, claims 27 and 33 have been amended to exclude the possibility of the weight ratio of (A):(B) being 100:0. This

ratio is amended to be from 95:5 to 30:70. Claim 28 is amended to require component (B) and also to recite this ratio range.

Accordingly, component (A) and component (B) are now required in all of the claims of the present application. Neither JP'374 nor Sadamitsu teaches using component (A) and component (B) as essential components at a specific weight ratio. In particular, the di-amide compounds disclosed in Sadamitsu are fundamentally different from the tri-amide compound (A) of the present invention.

(3) The polyolefin-based resin molded articles of amended Claims 27 and 28 comprise a specific amide-based compound (A) and a specific fatty acid metal salt (B) at a specific weight ratio, and have a degree of orientation of at least 2 as defined by the ratio of the (040) reflection intensity to the (110) reflection intensity determined by wide angle X-ray diffractometry.

As recited in Claim 33, the polyolefin-based resin molded article having such features can be produced by molding a molten polyolefin-based resin composition having a network structure formed of fibrous particles of specific amide-based compound (A) under temperature conditions such that the fibrous particles constituting the network structure do not dissolve or melt.

(4) In the polyolefin-based resin molded article of the present invention, **an important factor in achieving the orientation degree of at least 2 is that the specific amide compound (A) exhibits a distinctive structure, i.e., a network structure, in the resin composition during its production process.**

As shown in Fig. 5 of the present application, the formation of the network structure can be confirmed by measuring the storage modulus. This property is a characteristic of the amide compound (A) of the present invention.

As shown in the molding method (I) of Fig. 7 of the application, the molded product of the present invention can be produced by melting the amide-based compound, cooling the molten compound to prepare a network structure, then conducting molding under temperature conditions such that the fibrous particles constituting the network structure do not dissolve or melt.

During the molding procedure, the network structure becomes oriented in the flow direction of the molten polyolefin-based resin. This allows the crystals of the polyolefin-based resin to be highly oriented along the oriented amide compound.

(5) Sadamitsu teaches using, as  $\beta$  crystal nucleating agent, di-amide compounds, which have a structure completely different from that of the tri-amide compound used in the present invention. Sadamitsu is silent about the use of the specific amide compound (A) of the present invention. The present invention is different from Sadamitsu in terms of the distinctive components contained in the resulting molded articles. Accordingly, the polyolefin-based resin molded article of the present invention is clearly different from the polyolefin-based resin of Sadamitsu as a product invention.

(6) The Examiner seems to be of the opinion that the present invention is *prima facie* obvious, because he believes that the use of the tri-amide of JP'374 instead of the di-amide of Sadamitsu lead to the instant invention.

As shown in paragraph [0059] and Fig. 2, Sadamitsu discloses a method for inhibiting the orientation of the  $\beta$  crystals in polypropylene resins. However, Sadamitsu also discloses, in paragraph [0057] and Fig. 1, a method for orienting  $\beta$  crystals.

Applicant first refers to paragraph [0059] and Fig. 2, and then paragraph [0057] and Fig. 1 of Sadamitsu.

(7) As disclosed in paragraph [0059], the invention of Sadamitsu is characterized in that the amide compound is dissolved in the molten polypropylene-based resin and thereby rendered amorphous in the molding step, so as to **inhibit the orientation** of the  $\beta$  crystal layer **as much as possible** (see Fig. 2: a diagram showing the molding process of Sadamitsu).

As is clear from paragraph [0059] and Fig. 2, Sadamitsu teaches making the degree of orientation of the crystals in polypropylene resins as small as possible or, ideally, keeping the crystals unoriented. Accordingly, Sadamitsu teaches away from the inventions of claims 27, 28, and 33-40 of the present application, wherein the orientation degree of the crystalline lamellae of polypropylene resins is increased (i.e., having an orientation degree of at least 2).

Furthermore, even if there were a *prima facie* case of obviousness for these claims, the present invention, in which the crystals in polypropylene are oriented, achieves unexpected effects, which would rebut the *prima facie* case. The unexpected effects of the present invention are as follows:

The molded product of the present invention has improved rigidity coupled with impact resistance, both of which are physical properties that are usually difficult to impart at the same time.

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The molded article having such features can be produced by using a specific amide compound (A), and conducting molding under temperature conditions such that the fibrous particles of the amide-based compound do not dissolve or melt. This is clear from the pellets of Example I-28 shown in Table 11 and the pellets of Example II-28 shown in Table 12 of the present specification, and the comparison between the molded articles of Example I-32 and Example II-32 shown in Table 13. The results of these Examples are summarized below.

Example	Amide-based compound (A)		Fatty acid metal salt (B)		Storage modulus transition temperature (°C)		Kneading step	Molding step	Molded product	
	Type	Amount (wt part)	Type	Amount (wt part)	T <sub>sc</sub> (°C)	T <sub>sh</sub> (°C)	Resin temp. (°C)	Resin temp. (°C)	Flexural modulus (Mpa)	Degree of orientation
Example I-28	PCT-2MeCHA (74)	0.2	StCa	0.05	178	212	240	200	1600	2.1
Example II-28	PCT-2MeCHA (74)	0.2	StCa	0.05	178	212	240	240	1350	1.3

Example	Amide-based compound (A)		Fatty acid metal salt (B)		Storage modulus transition temperature (°C)		Kneading step	Molding step	Impact resistance
	Type	Amount (wt part)	Type	Amount (wt part)	T <sub>sc</sub> (°C)	T <sub>sh</sub> (°C)	Resin temp. (°C)	Resin temp. (°C)	50% breaking energy (J)
Example I-32	PCT-2MeCHA (74)	0.2	StCa	0.05	178	212	240	200	7.3
Example II-32	PCT-2MeCHA (74)	0.2	StCa	0.05	178	212	240	240	6.5

The molded articles of Example II-28 and Example II-32 were obtained by molding the pellets prepared in Example I-28 **according to molding method (II)** of the present invention (see page 82, line 4, to page 85, line 22, of the specification). In molding method (II), the molding was conducted under the temperature wherein the network structure of the amide-based compound was melted or dissolved, and **no network structure is present** (see page 83, lines 9-11 of the specification).

To be more specific, the molded articles were obtained under the conditions that cause less orientation. The resulting molded articles have an orientation degree of 1.3, a flexural modulus of 1350 MPa, and an impact resistance of 6.5 J.

The molded articles of Example I-28 and Example I-32 were obtained by molding the pellets prepared in Example I-28 **according to molding method (I)** of the present invention (see page 70, line 20, to page 82, line 3, of the specification). In molding method (I), molding was conducted under temperature conditions such that the **network structure of the amide-based compound is present**, i.e., under temperature conditions wherein the fibrous particles constituting the network structure do not dissolve or melt.

To be more specific, the molded article of Example I-28 and that of Example I-32 were obtained by conducting the molding under the temperature conditions wherein the fibrous particles constituting the network structure became oriented (see page 71, line 21, to page 72, line 2, of the specification). Accordingly, the molded articles obtained by employing molding method (I) of the present invention have oriented crystals of polypropylene resins with an orientation degree of at least

2. The molded articles of Example I-28 and Example I-32 have an orientation degree of 2.1, a flexural modulus of 1600 MPa, and an impact resistance of 7.3 J, thus exhibiting not only a significantly improved flexural modulus, but also significantly improved impact resistance (see page 80, lines 1-4 of the specification).

As described above, the polypropylene resin molded articles of Examples I-1 to I-32 exhibit superior properties both in rigidity (flexural modulus) and impact resistance to those of the polypropylene resin molded articles of Examples II-1 to II-32.

The polypropylene resin molded articles of Examples I-1 to I-32 have an orientation degree of not less than 2. These polypropylene resin molded articles were molded under temperature conditions such that the network structure of the amide-based compound does not dissolve or melt, i.e., under the conditions wherein the fibrous particles of the amide-based compound became oriented.

In contrast, the polypropylene resin molded articles of Examples II-1 to II-32 have an orientation degree of less than 2. These polypropylene resin molded articles were molded under temperature conditions such that the network structure of the amide-based compound dissolves or melts, i.e., under the conditions wherein the fibrous particles of the amide-based compound are less oriented.

This demonstrates that the inventions of Claims 27, 28, and 33-40 have **an increased orientation degree of at least 2**, and thereby improve both of flexural modulus and impact resistance.



Such effects are quite unexpected from the teachings of paragraph [0059] of Sadamitsu, which teaches **reducing the orientation as much as possible** to improve the impact resistance,

Accordingly, even if there were a *prima facie* case of obviousness, it would be rebutted by these unexpected results.

(8) Sadamitsu also discloses, in paragraph [0057] and Fig. 1, a method of molding polypropylene-based resin pellets at a temperature lower than that at which the network structure of the amide-based compound melts.

This description is similar to the present invention in the sense that the fibrous particles constituting the network structure of the amide-based compound are oriented.

However, paragraph [0057] of Sadamitsu teaches that such molding method produces molding products in which flexural modulus would be somewhat improved, but the impact resistance would be decreased, resulting in brittle molded articles. Brittle molded articles are generally undesirable. Accordingly, the disclosure of Sadamitsu would not motivate a person having ordinary skill in the art to orient the network structure of the amide-based compound. Therefore, paragraph [0057] and Fig. 1 of Sadamitsu teach away from the present invention.

Furthermore, as described in (7) above, the present invention improves not only the flexural modulus but also the impact resistance by orienting the fibrous particles of the specific amide-based compound. These effects cannot be expected from the disclosure of Sadamitsu, which teaches that the impact resistance would be decreased by orienting crystals of a di-amide compound having a structure different from the tri-amide compound used in the present invention.

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Accordingly, the present invention is unobvious from the disclosures of paragraph [0057] and Fig. 1 of Sadamitsu.

(9) As described above, it is clear that the inventions of Claims 27 and 28 of the present application are not obvious over JP'374 and Sadamitsu.

Furthermore, neither JP'374 nor Sadamitsu teaches or suggests the process defined in claims 33, 34, 35, and 37-40. Claims 18, 19, 23, 33-35, 37-40 are not obvious over JP'374 and Sadamitsu.

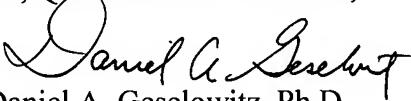
If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosure: Petition for Extension of Time

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